BELL LABORATORIES, HOLMDEL
(Bell Telephone Laboratories)
(Bell Labs)
(Holmdel Laboratories)
Bell Laboratories Road
Holmdel
Monmouth County
New Jersey

HALS NJ-7
HALS NJ-7

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

FIELD RECORDS

HISTORIC AMERICAN LANDSCAPES SURVEY
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HISTORIC AMERICAN LANDSCAPES SURVEY

BELL LABORATORIES, HOLMDEL

(Bell Telephone Laboratories; Bell Labs; Holmdel Laboratories)

HALS No. NJ-7

Location: Bell Laboratories Road, Holmdel Township, Monmouth County, New Jersey

The main entrance to the 460-acre Bell Laboratories, Holmdel campus is located on the south side of Crawfords Corner Road, east of the intersection with Roberts Road. Its geographic coordinates are Latitude 40.36516, Longitude -74.16747 (Google Earth, Simple Cylindrical Projection, WGS84). These coordinates represent the location of the Bell Laboratories building at the center of the campus.

Present Owner: Somerset Development Bell Works and Toll Brothers

Present Use: Bell Laboratories vacated the property in 2006. The main building is currently undergoing redevelopment for commercial offices and retail. Approximately 135 acres immediately surrounding the building including the "keyhole" with its entrance drives will be maintained as open space and parking lots. Approximately 236 acres of the remaining outdoor campus is being redeveloped for housing.

Significance: Bell Laboratories Holmdel was constructed from 1959 to 1966 according to a plan and design of Finnish-American architect Eero Saarinen (1910-1961). Although Saarinen passed away in September 1961 before the project was completed, his protégés Kevin Roche (1922-) and John Dinkeloo (1918-1981) finished the work as Saarinen had envisioned. Bell Labs is a significant pioneering example of a type of modern American suburban landscape that has been variously termed a corporate campus, corporate estate, corporate villa or industrial Versailles.

Bell Labs was one of five of Saarinen's completed corporate campuses; the other four were the General Motors Technical Center in Warren, Michigan (1948-1956), the IBM Manufacturing and Administrative Center in Rochester, Minnesota (1954-1956), the IBM Thomas J. Watson Research Center in Yorktown, New York (1956-1961) and the Deere & Company Headquarters in Moline, Illinois (1956-1964). While General Motors was the earliest of the five and arguably the most influential, the others illustrated how basic design features – centrally-located large-scale modernist buildings, entry drives, prominent water features, parking lots and an encompassing pastoral landscape – could be arranged in various ways to project a powerful corporate presence. It was a distinctive type of

new postwar suburban landscape designed at an automobile scale, very different from prewar corporate headquarters, which had been mostly located in downtown skyscrapers or adjacent to manufacturing facilities.

At Holmdel, Saarinen placed a six-story, 700-foot-long cubical, modernist building within a site of over 460 acres (the building was expanded to 1,000-foot-long in 1982-85 by Kevin Roche John Dinkeloo & Associates). The building is best known for its innovative use of mirrored-glass curtain walls, which reflect pools and pastoral landscape back at the outside viewer. It also has been noted for its high-tech modular interior spaces, which were designed to Bell Labs' exacting requirements. Traffic circulation was provided by a grand entry drive or esplanade, side entrance drives for employees and service vehicles, and an elliptical belt road surrounding the building. Service buildings were strategically placed outside the ellipse and hidden by graded mounds or trees. Visitors parked near a grand reception lobby while thousands of employees parked inside the ellipse and used less-conspicuous side entries. The main "spray pool" at the front of the building was symmetrical with fountains forming a curtain wall, while the side pools were asymmetrical, softening the edges and providing a transition between the formality of the main building and the surrounding pastoral landscape. The side pools were replaced with additional parking when the main building was expanded in the 1980s. A rear pool and walking path were constructed behind the lab to replace the side pools. This amoebic-shaped pool was planted with specimen trees and shrubs and included fountains and an island connected to the shore with a pedestrian bridge.

While Saarinen was fully in charge of all aspects of design and known for his incredible attention to detail, he collaborated closely with his clients and sub-consultants. At Bell Labs and several of his other corporate campuses, Saarinen worked with Japanese-American landscape architect Hideo Sasaki (1919-2000), founder of Sasaki, Walker and Associates. During the 1950s and 1960s, Sasaki and his students at Harvard University's Graduate School of Design became known for a multidisciplinary approach to landscape architecture, and this approach meshed well with Saarinen's equally strong feelings about comprehensive design concepts, flexibility to client's demands, and a balance of idealism with pragmatism.

Although the fundamental scheme for Bell Labs was Saarinen's, Sasaki worked within the natural flat topography to create a landscape plan that eased the square and hard-edged building into a park-like setting. He

retained elements of the landscape's agricultural past, notably tree-lined streams, broad lawns where there had once been fields of corn, and copses where there had once been farmhouses. Near the building itself, the landscape became more formal with rows of trees and shrubs planted in geometrical patterns that reinforced the division of drives, parking lots, walkways and building entrances.

Bell Labs, when its first phase opened in 1962, was immediately recognized as a significant blending of architecture, engineering and landscape design. Architectural critic Allan Temko described it as "Bell's palatial baroque park, which, in this country at least, is unrivaled as a formal setting for a technological building."[1] It was a fitting monument to Bell Labs, a leader in advanced information, communications and military technologies.

Project Information: Documentation of Bell Laboratories Holmdel was undertaken in 2015-2016 for the Historic American Landscapes Survey (HALS), Paul D. Dolinsky, Chief, one of the National Park Service's Heritage Documentation Programs (HDP), Richard O'Connor, Chief. The project was sponsored by Toll Brothers, fulfilling a stipulation under a land-use permit issued by the New Jersey Department of Environmental Protection, Division of Land Use Regulation and the Historic Preservation Office to mitigate impacts from the construction of a new housing development on a portion of the former Bell Laboratories Holmdel campus. The measured drawing documentation was undertaken by Christopher M. Stevens, HALS Landscape Architect, and Jason W. McNatt, HALS Architect. The historical report was produced by Hunter Research, Inc. under the direction of Patrick Harshbarger, Vice President/Principal Historian. The large-format photography was produced by contract photographer Douglas Harnsberger. On-site assistance was provided by Kevin Kernahan, Vice President, Toll Brothers.

Historian: Patrick Harshbarger, April 2016

[1] Allan Temko, *Eero Saarinen*, Makers of Contemporary Architecture (New York: George Braziller, 1962).

PART I. HISTORICAL INFORMATION

A. Physical History

1. Date of Establishment: 1959-1962 (Phase I); 1964-1966 (Phase II); Expansion 1982-1985 (Phase III).

2. Design Team[2] for Phases I and II:
Eero Saarinen and Associates (architects and lead consultant/planner)
Sasaki, Walker and Associates, Inc. (site planners and landscape architects)
Dan Kiley (landscape architect for interior courtyard concepts)
Severud-Elstad-Krueger Associates (consulting structural engineers)
Jaros Baum and Bolles (consulting mechanical engineers)
Architect for Phase III:
Kevin Roche John Dinkeloo and Associates[3]

3. Construction[4]:
Western Electric Company, Plant Design and Construction Division (construction management)
Frank Briscoe Construction Company (general contractor for Phases I and II)

4. Original and Subsequent Owners and Occupants: Bell Laboratories was a jointly owned research and development arm of the American Telephone & Telegraph Company (AT&T) and the Western Electric Company. In 1984, as a consequence of divestiture, AT&T Technologies assumed the business of Bell Laboratories. In 1996, AT&T Technologies spun off Bell Laboratories to Lucent Technologies, Inc. In 2006, Lucent closed Bell Laboratories, Holmdel as a result of downsizing, consolidating its operations in the region at the Bell Laboratories, Murray Hill. In 2013, the Holmdel property was purchased by Somerset Development Corporation and Toll Brothers. Somerset retained a 135-acre campus inclusive of the main building, a system of drives and the formally landscaped portion of the property. Toll Brothers acquired the remaining property for a residential development.

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[2] As documented by original plans, drawings, letters and notes archived in the Eero Saarinen Collection [ESC], Sterling Memorial Library, Yale University, New Haven, Connecticut. The copyright to these materials was transferred to Yale University where applicable. They are cited extensively throughout this narrative report.
[3] Roche and Dinkeloo did not use a comma to separate their names.
[4] [Bell Telephone Laboratories – Western Electric Company], Holmdel Laboratory Project, Organization and Procedure (March 31, 1959) [ESC Series IV, Box 421].

5. Periods of Development:

a. Original Plans and Construction (Phases I and II): Eero Saarinen and Associates (Saarinen) was commissioned in 1957 to develop plans for a state-of-the-art corporate campus for Bell Telephones Laboratories (Bell Labs). Bell Labs had selected a 460-acre rural property in Holmdel Township, Monmouth County, New Jersey where it already had a small lab devoted to the development of wireless receivers and antenna systems. In 1959, after an intense period of conceptual development in which Bell Labs scientists provided input on technical criteria for the lab design, Saarinen produced a comprehensive master plan for the Holmdel labs. It provided for the campus to be laid out symmetrically across a primary northeast-to-southwest axis with a massive box-like lab building at the center of the plan. A system of drives formed a curvilinear pattern that has been described as a "keyhole" shape. The first phase of construction featured a six-story, 700-foot-long, 700,000-square-foot, glass-walled building that would be doubled in size during a second phase of construction.

Ground was broken in 1959 and the first phase completed in 1962. The second phase was begun in 1964 and completed in 1966. Sadly, Saarinen died in September 1961 but architects Kevin Roche and John Dinkeloo, who worked for Saarinen before establishing a very successful architectural firm of their own, completed the work much as Saarinen had envisioned it. Also completed during the first phase were a service building, sewage treatment plant and radio range building.

Saarinen's master plan extended beyond the main lab and service buildings to a landscape designed with the assistance of landscape architect Hideo Sasaski of Sasaki, Walker and Associates. Automobile traffic circulation was provided by a double-ellipse belt road and three entrance drives, the longest an esplanade over a half-mile in length. A 127-foot-tall water tower, designed by Saarinen to be sculptural, graced the main entrance. Within the ellipse were parking lots, a symmetrical "spray pool" in front of the building, two asymmetrical side ponds and a formal landscape planted in geometrically arranged beds. Almost 400 sugar maple trees were planted along the drives forming allées, while beyond the drives were broad lawns punctuated by copses of flowering dogwood, eastern redbud, eastern red oak and several other varieties of trees. In many locations, Sasaki chose to retain existing trees within the formerly rural landscape. These retentions included mature trees that had grown around two farmhouses (the houses and outbuildings themselves were demolished) and hundreds of trees that already lined the streams that crossed or bordered the property. This landscaping work was also completed by late 1966.[5]

[5] Eero Saarinen and Associates, Holmdel Laboratory, Site Plans 1957 [ESC, Series IV, Box 592]; Architectural Record Sepias, *circa* 1959-1966 [ESC, Series IV, Boxes 413-414]; Final Stage Construction Plans, *circa* 1959-1966 [ESC, Series IV, Box 416]; Planting Plans and Details, 1961 [ESC, Accession

b. Changes and Additions: Between 1982 and 1985, the Bell Labs building was extended from 700 feet to 1,000 feet in length in a project that was referred to as Phase III, although it had not been part of the original Saarinen master plan. This expansion was achieved by adding 150-foot-long steel-frame extensions to the east and west ends of the building. These extensions were designed by Kevin Roche John Dinkeloo and Associates and respected the glass-walled building's original exterior appearance and symmetry.

Expansion required some significant changes to the original landscaping inside the elliptical belt roads. The east and west ponds were filled in to create additional parking space. A new pond was excavated south of the building, replacing a lawn that Saarinen and Sasaki had created to provide a vista for diners in the building's cafeteria. The new pond, which was referred to as "the lagoon," had two islands, a curvilinear amoebic-shaped plan and a perimeter walkway with a footbridge to the central island. The area around the lagoon was planted with specimen trees that shaded a walkway along the pond's edge in a Japanese garden-inspired style. A combination nature and exercise trail was also built to the northwest of the ellipse in the mid-1980s, meandering along one of the streams that crossed the property. The addition of walkways and trails was considered important to promoting employee health and creativity.[6]

B. Historical Context

1. Landscape Development

Agricultural Roots.[7] The Bell Labs property was originally part of an 1,800-acre tract granted by the East Jersey Proprietors to Richard Stout in the 1660s. Stout, his wife Penelope (who endured a tale of shipwreck, deprivation, capture by Native Americans and sale to the Dutch before marrying Richard in the mid-1640s) and their family were among the first settlers in the Holmdel area of Monmouth County, although the precise location of their original homestead remains uncertain. In the late 1680s, Richard Stout subdivided his lands and sold off parcels to his offspring. The area of the Bell Labs property fell within tracts received by Richard's sons, Jonathan, Peter and Benjamin. By the early 18th century, each of these tracts was occupied by at least one farmhouse.

2015-M-047, Additional Material, Box 1]; Wolf Von Eckardt, "You Can't See the Foyer for the Trees," *Horizon,* Volume 13, Number 3 (Summer 1971), pp. 41-47.

[6] Kevin Roche John Dinkeloo and Associates, Bell Telephone Laboratories, Holmdel, Addition Phase III, Site Plan, Sheet A-1, 1980 [ESC, Box 650].

[7] This section relies heavily on a narrative produced by Hunter Research, Inc. for Toll Brothers in conjunction with a Phase IB archaeological survey. See Hunter Research, Inc., Phase IB Archaeological Survey, Reserve at Holmdel (Block 11, Lot 83.03), Regency at Holmdel (Block 11, Lots 38.04 and 38.06), Holmdel Township, Monmouth County, New Jersey (August 2015), Chapter 4.

A map of the Bell Labs vicinity, surveyed by the U.S. Coast and Geodetic Survey in 1840, shows farms within a patchwork of well-defined fields interspersed with a number of irregular woodlots. Two historic roads correspond to modern highways: Crawfords Corner Road and Middletown Road, which define respectively the north and east sides of the later Bell Labs property. Two farmstead nuclei fell within the property: one, accessed from Crawfords Corner Road and known as the Hendrickson/Schenck farmstead, was within the northeastern portion of the site along a farm lane roughly corresponding to an alignment that would eventually be used for Bell Labs' esplanade road; the other farmstead, which was reached from Middletown Road and known as the Holmes-Hendrickson farmstead, was located just to the south of the site of the elliptical belt road. Between 1851 and 1861, a third farmstead known initially as the Stillwell farm and later as the Roberts House was built on the west side of the property, along a farm lane that would eventually become Roberts Road.[8]

Early Bell Telephone Laboratories at Holmdel, 1929-1959. In 1929, Bell Laboratories acquired a substantial block of Hendrickson family farm property south of Crawfords Corner Road. The site, initially little more than an outpost of Bell Telephone's main laboratories in New York City, specialized in the development of sensitive wireless receivers and transmitters for transatlantic radio-telephone communications. The Holmdel location was attractive to Bell Labs mainly due to its isolation, meeting technical criteria for distance from man-made static, which interfered with sensitive radio equipment. It was also only about 13 miles north of the Deal Test Site, where the initial ship-to-shore short-wave experiments had been undertaken in 1919.

The first experimental work at Holmdel concentrated on making short-wave radio practical for overseas telephonic communications. The scientists developed a rhombic (diamond-shaped) directional antenna that could pick up very weak signals. These antennae were soon employed at an AT&T facility near Lawrenceville, New Jersey, which served as a hub for all international overseas phone calls from the United States to Europe, the Middle East, South America and the Pacific until the introduction of satellite communications in the 1960s. Karl G. Jansky (1905-1950), while studying short-wave static at Holmdel in 1931, discovered signals originating in outer space, giving rise to the new scientific field of radio astronomy.[9] The Holmdel scientists

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[8] U.S. Coast and Geodetic Survey, Eatontown to Lawrence (1840), electronic document, http:///historicalcharts.noaa.gov/historical [accessed August 2015]; Jesse Lightfoot, *Map of Monmouth County* (Middletownpoint, New Jersey: J.B. Shields, 1851); S.N. Beers, F.W. Beers and H.F. Walling, *Map of Monmouth County, New Jersey* (New York: Smith, Gallup & Holt, 1861); F.W. Beers, *Atlas of Monmouth County, New Jersey* (New York: Beers, Comstock & Cline, 1873); Bell Laboratories, Holmdel, Aerial Photographs (1957), on file at Nokia Corporation Archives, Murray Hill, New Jersey; Bell Laboratories, Holmdel, Construction Photographs (1959), on file at Nokia Corporation Archives, Murray Hill, New Jersey.

[9] Jansky's achievement was commemorated in 1998 with the dedication of a memorial and sculpture in the shape of a horn antenna within the median of the labs' belt roads (see below in *Landscape Changes and Additions, 1967 to present*).

also carried out much of the fundamental research in transmitting radio microwave signals through hollow ducts or pipes called waveguides, laying the groundwork for modern-day satellite and cellular communications.[10]

The early technological achievements at Holmdel were impressive but the physical infrastructure was rather modest, consisting of a complex of one-story, wood-frame buildings that might have been easily mistaken for agricultural outbuildings. Some scientists even lived in the old Roberts and Hendrickson farmhouses that had been purchased by Bell Labs. In fact, the resident engineers dubbed Holmdel the "Turkey Farm," suggesting that the labs there more closely resembled a poultry farm than a modern research facility. Nonetheless, the level open ground was ideal for rhombic antenna fields and waveguides, which were often thousands of feet long.[11]

The completion of the Garden State Parkway in 1954 opened up much of Monmouth County to intensified suburban development. The parkway passed about one-half mile north of the Bell Labs, Holmdel site. Aerial photographs taken in the late 1950s show the spread of tract housing into the Holmdel countryside. One such housing estate was laid out and largely constructed at the southeast corner of Crawfords Corner Road and Roberts Road before being purchased by Bell Labs in 1957. The brand-new houses were demolished, along with the older Bell Labs buildings and the Hendrickson/Schenck and Stillwell farm buildings. The Monmouth County Historical Association prevailed on Bell Labs to preserve the mid-18th-century, Dutch-frame, Holmes-Hendrickson farmhouse, which was relocated to prevent demolition. The house is now situated roughly a mile away from Bell Labs on the west side of Longstreet Road near Holmdel Park.[12]

Planning for Bell Laboratories, Holmdel, 1957-1959. In 1957 Bell Labs engaged Eero Saarinen and Associates to design a modern laboratory and corporate campus at Holmdel. Saarinen was fresh off completion of the General Motors Technical Center in Warren, Michigan, and the IBM Manufacturing and Administrative Center in Rochester, Minnesota, both considered highly successful projects for major corporate clients. Other recent commissions, particularly the Massachusetts Institute of Technology's Auditorium and Chapel, had placed Saarinen in the top ranks of American Modernist architects. Saarinen was featured on the cover of *Time* magazine's

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[10] Bell Telephone Laboratories, *Bell Telephone Laboratories at Holmdel* (Bell Telephone Laboratories, *circa* 1962), n.p.; Bell Telephone Laboratories, Bell Laboratories at Holmdel Has Long, Distinguished History, Press Release (September 24, 1962) [ESC, Series IV, Box 420]; Save the Cradle of Radio Astronomy, manuscript (*circa* 2006), on file at the New Jersey Historic Preservation Office, Trenton, New Jersey.

[11] Scott G. Knowles and Stuart W. Leslie, "Industrial Versailles: Eero Saarinen's Corporate Campuses from GM, IBM, and AT&T," *Isis,* Vol. 92, No. 1 (March 2001), p. 24.

[12] National Environmental Title Research, *Historic Aerials*, electronic document, www.historicaerials.com [Aerial photograph of Holmdel Township, 1931-1961] [accessed January 2016].

July 2, 1956 issue, an unusual honor for an architect. *Time* stated that no other modern American architect had "a better proportioned combination of imagination, versatility, and good sense."[13]

This publicity and success brought Saarinen to the attention of Bell Labs executives, who were seeking a top-notch architect to design a new laboratory. In their eyes, the main purpose of the Holmdel project was to relieve overcrowded conditions at Bell Labs, Murray Hill, which was located about 30 miles northwest of Holmdel and had served as the company's suburban metropolitan New York City research campus since 1941 (the original Bell Labs had been established in downtown Manhattan in 1925). The firm of Voorhees, Walker, Foley and Smith had designed Murray Hill's five-story, brick, factory-like building, which was conservative in architectural appearance. Murray Hill's 240 acres had the feeling of a college campus or perhaps a country club. By the late 1950s, Murray Hill had been expanded to accommodate a staff of more than 4,000. Since it was corporate policy to never have more than 5,000 employees in one place, Bell Labs needed a new facility for its burgeoning workforce.[14]

The choice of Eero Saarinen to design the new Holmdel campus signaled that Bell Labs, and its parent corporations AT&T and Western Electric, were in favor of something architecturally innovative. Saarinen began with a comprehensive study of Murray Hill, figuring out in his own mind what worked and didn't work there from an architectural standpoint, as well as listening to the requirements of the scientists and a committee of Bell Labs executives overseeing the project. Among the design features that had been a success at Murray Hill was a modular lab space based on a 6-by-6-foot unit that could be reconfigured into any multiple. Saarinen developed a more generous 12-by-12-foot unit for Holmdel, even building a two-story full-scale model that was erected and tested at Murray Hill. Saarinen also latched onto the idea that Murray Hill's interior plan, which consisted of very long and straight interior hallways flanked by offices and labs, was inefficient and could be improved by the introduction of courtyards and the placement of the hallways around the periphery of the building blocks, an idea he had developed for the IBM Thomas J. Watson Research Center, which had begun construction in 1956. These and other details consumed Saarinen's initial planning with Bell Labs. In early 1959, Bell Labs issued a more than 100-page document called simply, *Planning Requirements, Holmdel Laboratory*, which comprehensively described the company's expectations for the new lab and campus based on discussions with the architect. It was clear from the report that Bell Labs executives and scientists were concerned mostly with the lab building demanding that it be designed to afford maximum "flexibility and universality of space" so it could evolve with the needs of the scientists and their research projects.[15]

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[13] "Architect Eero Saarinen, The Maturing Modern," *Time: The Weekly Newsmagazine*, Volume LXVIII, No. 1 (July 2, 1956), p. 50.
[14] Knowles and Leslie (2001), pp. 19-24.
[15] Bell Telephone Laboratories, P*lanning Requirements, Holmdel Laboratory* (February 10, 1959), Introduction [ESC, Accession 2008-M-065, Box 3]; "Holmdel: 1961," *The Reporter* [Bell Labs in-house news magazine] (October 1959) .

Saarinen, and practically everyone involved in the project, considered Holmdel's lab building as the centerpiece of the project, once he unveiled the basic concept in 1958. The building was described at the time as "a radically new big block or loft plan for laboratories" because of its Modernist architecture, massive size and plan of courtyards and main hallways that ran like galleries around the rim of the window-walled exterior.[16] The innovative Mylar-laminated, mirrored glass curtain walls attracted everyone's attention. Upon completion of Phase I in 1962, *Architectural Forum* called the Bell Labs building "the biggest mirror ever made by man," an indication of just how startling the new mirrored-glass was at that time.[17]

As compared to the exacting requirements Bell Labs made of the lab building at Holmdel, the company placed few specific aesthetic requirements on the development of Holmdel's 460-acre landscape, leaving those details up to the architect within a set of basic parameters. For example, Bell Labs required parking accommodations for 4,500 cars and no parking area more than 1,000 feet from a building entrance. Bell Labs executives were particularly concerned about traffic flow into and out of the automobile-oriented suburban campus, wishing to avoid traffic jams. Bell Labs conducted detailed traffic studies to determine whether the parking lots and drives functioned efficiently during rush hours. It was determined during these studies to make the eastern drive a one-way exit during the evenings.[18] Western Electric engineers also played a vital role in developing the technical specifications for a spray pond, which they determined had to have a surface area of six acres in order to be used to cool the condensing water for a state-of-the-art air conditioning system. The pond was also to serve as a secondary fire reserve. Saarinen wanted the pond to be both functional and aesthetic. Aside from obvious issues of water supply and drainage, however, Bell Labs stated in their *Planning Requirements* (1959) that landscaping would "be covered later" and that the "details have not been decided and must be discussed further with the architect."[19]

Between 1957 and late 1958, Saarinen made a serious study of the Holmdel site as indicated by aerial and panoramic photographs and sketches in his collected papers. From the outset, he seems to have settled on placing the lab building at a central location on an area of relatively flat ground approximately one-half mile south of the intersection of Crawfords Corner Road and Roberts

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[16] Lawrence Lessing, "The Diversity of Eero Saarinen," *Architectural Forum,* Volume 113, Number 1 (July 1960), p. 101.
[17] Walter McQuade, "The Telephone Company Dials the Moon," *Architectural Forum,* Volume 117 (October 1962), pp. 88-97, and "Bell Labs' Mirrored Superblock," *Architectural Record* (October 1962), pp. 145-152. There was also a follow-up article at the end of Phase II, "The Biggest Mirror Ever," *Architectural Forum,* Volume 126, Number 3 (April 1967), pp. 33-41 and "Saarinen's Looking Glass Wall," *Progressive Architecture* (January 1967), p. 38.
[18] Ibid., p. 1.6-1; Bell Laboratories Holmdel, Construction Photographs [Traffic Studies], 1961-62; Holmdel Laboratory Traffic Flow (*circa* 1962), on-file at Nokia Corporation Archives, Murray Hill, New Jersey.
[19] Ibid., p. 1.6-1.

Road, slightly south of the location of the "Turkey Farm" buildings.[20] Saarinen's early concepts and models suggest that he quickly latched onto the idea of a grand entry drive or esplanade from Crawfords Corner Road trending northeast to southwest and roughly along a low ridge separating two tributaries of Hop Brook. This alignment basically followed the former farm lane to the Hendrickson/Schenck house and the original Bell Labs facility. He placed the long axis of the rectangular lab building perpendicular to the esplanade. It followed that campus's drives, ponds, plantings and parking lots would be placed symmetrically across the long primary axis. Most early versions of the master plan placed a large reflecting pool in front or to the north of the building with the esplanade road dividing to go around the pool. Saarinen also contemplated a grid of circulation drives and parking lots to surround the lab building, which was usually depicted as a series of building blocks arranged to form one or more courtyards.

In a final version of the selected master plan, known as alternate "C", dating from December 1958, the grid-like pattern of roads and parking lots contemplated by Saarinen in previous sketches was replaced by an elliptical belt road and curvilinear drives, practically eliminating all hard right-angle turns. This design has sometimes been referred to as the "keyhole" design, although this term does not appear in the Saarinen papers at Yale University or descriptions of the property from the 1960s. The keyhole is delineated by the drives with their outer edges planted with trees to form allées. These significant landscape refinements in the final master plan were likely a result of the influence of landscape architect Hideo Sasaki who was brought into the project in late 1958. A final "detailed master plan" of the keyhole is the first document in Saarinen's project files to credit Sasaki. Under Sasaki's influence other details began to emerge including angled parking lots within the ellipse, the Japanese garden-inspired east and west ponds, and the sculptural water tower at the main entrance, also with its smooth curved edges contrasting with the hard, crisp, dark-mirrored laboratory cube.[21]

Construction of Bell Labs Holmdel, Phase I, 1959-1962. Phase I construction began in August 1959. The first six months of work were taken up with site preparation, which included grading and excavation. Saarinen's office conducted a detailed cut-and-fill analysis to determine elevations that would result in nearly equal quantities of earth cut and fill, meaning that very little earth would need to be moved to or from the site, an important cost savings. Nevertheless, more than 900,000 cubic yards of earth were redistributed. The lab's first floor was set partially below grade at 115.125 feet above sea level with the front north-facing entry at the level of the second floor at elevation 130.6 feet. The first floor was surrounded by a podium planted with hawthorn trees (*Crataegus*) along the top, which also concealed the vents for the building's air handlers. The podium achieved aesthetic qualities desired by Saarinen since it appeared to raise

[20] Eero Saarinen and Associates, Bell Telephone Laboratories Holmdel Sketches (1957-59) [ESC, Series IV, Box 682]; Bell Telephone Laboratories Holmdel Presentation Boards (1957-58) [ESC, Series IV, Box 692]; Bell Telephone Laboratories Holmdel Model Photographs and Slides (1957-59) [ESC, Series IV, Boxes 420 and 421].
[21] Sasaki, Walter and Associates, Detailed Master Plan, Holmdel Laboratories, Western Electric Company, Holmdel, New Jersey (December 1958).

the front of the building above the surrounding landscape. Interestingly, the entrance at Crawfords Corner Road was at elevation 160 feet, nearly level with the building's top floor, although few visitors perceived the difference in height given the distance from the building and the even contouring of the esplanade. The architect thus presented Bell Labs' visitors, all of whom were presumed to arrive by automobile, with a sweeping vista that featured the mirrored-glass building as its focal point.[22]

Natural sources of surface water at Holmdel were insufficient to provide a dependable water supply, so Bell Labs drilled three deep wells. Water was pumped directly from the wells to a water-softening treatment plant located in a 35,000-square-foot service building that was also a garage and storehouse. The service building was a plain unadorned one-story structure located southwest of the main lab, outside the belt road, and screened from view by a dense planting of trees.[23]

From the treatment plant, water was pumped northeast across the property to a 127-foot-high, elevated water tank with storage capacity of 310,000 gallons. Prior to designing the tank, John Dinkeloo presented Bell Labs with a memorandum summarizing his study of elevated water tanks throughout the United States and Europe. The intent was, apparently, to persuade the client to support a large sculptural water tank at the entrance to Bell Labs, Holmdel. Water tanks were foremost utilitarian structures driven by considerations of storage capacity and water pressure, but Saarinen wanted to place the tank at Holmdel front-and-center at the main entrance. Due to the flat topography, there were no inconspicuous locations for Holmdel's water tank. The architect's design solution resulted in a memorable landscape feature, a water tank with three elliptical-section legs supporting a bowl-shaped tank with a slightly domed upper surface. The tank was unique and sculptural, prompting some observers to believe that it was meant to symbolize Bell Labs, perhaps vaguely representing the shape of a point-contact transistor, an electronic component, which ironically had been invented at Bell Labs, Murray Hill, not Holmdel, in 1947-48. If the tower was indeed inspired by the shape of the original transistor, Saarinen made no note of it in his collected papers, nor did Bell Labs advertise it in the many official press releases and descriptions of Holmdel that were issued to the public during the early to mid-1960s.[24]

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[22] Eero Saarinen and Associates, Holmdel Laboratory, Cut and Fill Analysis (1959) [ESC, Series IV, Box 415]; Site Plan Sepias (1959) [ESC, Series IV, Box 419].

[23] Bell Telephone Laboratories, Construction Highlights of Bell Laboratories' New Development Center at Holmdel, N.J., Press Release (September 24, 1962), p. 9 [ESC, Series IV, Box 420].

[24] John Dinkeloo [Eero Saarinen and Associates] to R.H. McCarthy [Western Electric Company], letter and report on water tanks (November 27, 1959) [ESC, Accession 2008-M-065, Box 6]; Eero Saarinen and Associates, Architectural Record Sepias, Elevated Water Tank, Sheet 191 (1959) [ESC, Series IV, Box 414]; Eero Saarinen and Associates, Severud-Elstad-Krueger, and Jaros, Baum and Bolles, Specifications for Elevated Water Tank for the Holmdel Laboratory (June 17, 1960) [ESC, Series IV, Box 422]; Doug Kirby *et al.*, *World's Largest Transistor, Holmdel, New Jersey*, electronic document, www.RoadsideAmerica.com (2016) [accessed February 2016].

As originally conceived and built, there were four pools, two to the front (north) of the building and two to the sides (east and west).[25] The pools served as catch basins for run-off, as documented by site plans for the underground storm-sewer pipe system, but water could also be pumped from the wells to keep the ponds at full height. The pool immediately in front of the building covered about six acres and was known as the "spray pool." Below the surface of the water it was outfitted with pipes and spray nozzles to shoot condenser water for the air-conditioning system into the air for evaporative cooling. Bell Labs scientists developed this innovative system, carefully matching the volume of the spray pool to strict technical specifications for maintaining temperature and relative humidity inside the building, believing it would prove more efficient than other systems then commercially available. The system also had aesthetic advantages since Saarinen did not need to accommodate unsightly cooling towers within the design. The system, although innovative, apparently did not live up to expectations and was supplemented by a more conventional system when the building was expanded in 1982-85.[26]

During 1960, general contractor Frank Briscoe Construction Company of Newark, New Jersey, focused efforts on construction of the lab, first with the driving of piles for the foundation and then forming the reinforced-concrete frame. Also completed during 1960 were the service building and the radio range building, respectively southwest and northwest of the elliptical belt road. The radio range building was located at the southeast end of a new radio waveguide field that stretched out nearly 1,500 feet northwest across the campus to Roberts Road. By early 1961, the lab building was taking shape and during the summer of 1961 the aluminum-framed, glass curtain wall was installed. It was during this same period that landscape architect Sasaki, Walker and Associates prepared a set of detailed landscaping plans.[27]

In May 1961, Sasaki's office presented Saarinen with a 12-sheet plan set and planting schedule showing the proposed planting scheme for both Phases I and II. In early August 1961, Sasaki traveled to Saarinen's offices in Cranbrook, Michigan, to meet with the architect and work out the final details. The summary plant schedule listed 16 species of trees and shrubs, and 22,785

[25] The two pools to the front (north) of the main lab were labeled on some site plans as Pool #1 and Pool #2 or alternatively as the north pool and the south pool, although this would later become confusing when an additional pool, known as the lagoon, was actually built to the rear (south) of the lab in 1982-85. The pools to the front were also referred to as "the spray pool" since they had the fountains for cooling condenser water from the air-conditioning system. The two smaller pools to the sides of the building, which were not part of the air conditioning, were simply known as the "east pond" and the "west pond." They were removed for additional parking in 1982-85.

[26] H.S. Kehrli, Special Features of Year-Round Air Conditioning System, New Bell Telephone Laboratories, Holmdel, New Jersey (1959); Bell Telephone Laboratories, Construction Highlights (Sept. 1962), p. 7; Kevin Roche John Dinkeloo and Associates, Bell Telephone Laboratories, Holmdel, New Jersey, Addition, Phase III (1981) [ESC, Series IV, Box 650].

[27] Western Electric Company, Inc., Holmdel Laboratories, Construction Photographs, 1960-1961, on file at Nokia Corporation Archives, Murray Hill, New Jersey.

individual plants, over eighty percent of which were low-growing junipers intended for ground cover around the lab and in the beds surrounding the parking lots. It appears that many of these juniper beds were never planted since Bell Labs reported planting only 7,900 plants at the end of Phase I in September 1962. Some additional planting took place during Phase II in 1964-66 or even later, based on a review of Bell Labs corporate photographs and aerial views. Still, it does not appear that the full planting scheme was implemented.[28]

Sasaki's planting scheme incorporated a number of design concepts that were repeated across the Holmdel campus. The entrance drives were lined with sugar maples (*Acer saccharum*) uniformly set back 20 feet from the edge of the pavement and spaced 60 feet apart. More than 400 sugar maple saplings were planted. Where the entrance drives met public roads, Sasaki placed clumps of trees to form vegetative screens. Once mature these would provide drivers with semi-obstructed views of the campus through the tree trunks and overhanging limbs. At the main northern entrance at Crawford Corners Road, the screen consisted of a mix of sugar maples (*Acer saccharum*), eastern red oak (*Quercus borealis maxima*) and red maple (*Acer rubrum*), which were selected in part to provide autumn color. At the western entrance at Roberts Road, Sasaki retained the mature trees that had surrounded the Stillwell farmhouse as a screen, supplementing them with sugar maples (*Acer saccharum*) and eastern red oak (*Quercus borealis maxima*). Beyond the tree-lined drives, Sasaki left open meadows where there had once been agricultural fields, and he specified retaining the many mature trees that lined the tributaries of Hop Brook, which formed a natural background to the meadows and created a perimeter. Sprinkled across this landscape were single trees and copses both to provide visual interest in the mid-ground and to screen service buildings. Another copse consisted of a selection of mature trees that were retained around the former site of the Hendrickson/Schenck house just to the east of the esplanade road.[29]

A more formal landscape was to surround the lab within the ellipse. The building was to be flanked east and west by two 1,500-foot long rows of eastern white pine (*Pinus strobus*) closely planted in a diamond-shaped pattern. Once mature, these rows would serve to frame the views looking north and south from the building, drawing the eye to distant vistas, and also to screen the employee parking lots located off to the southeastern and northwestern ends of the building.

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[28] Sasaki, Walker and Associates, Inc. and Eero Saarinen and Associates, Planting Plans and Details, Sheets 49-61 (May 1961) [ESC, Accession 2015-M-047, Box 1]; H. B. LaForce to John Dinkeloo, telegram [regarding Sasaki meeting] (July 31, 19610 [ESC, Accession 2008-M0-065, Box 7]; Bell Telephone Laboratories, Construction Highlights (Sept. 1962), p. 9. The Bell Labs press release of September 1962 stated that 7,900 trees and shrubs were planted, considerably less than the 22,875 shown on Sasaki's plans of May 1961. The 7,900 number has been repeated in many official histories of Holmdel, but this may have represented only those plants planted during Phase I. Sasaki's plans presented both the Phase I and Phase II landscaping. Still photographs of this period do not show several of the juniper beds shown on the plans, suggesting they were never planted.

[29] Sasaki, Walker and Associates, Inc. and Eero Saarinen and Associates, Planting Plans and Details, Sheets 49-61 (May 1961) [ESC, Accession 2015-M-047, Box 1].

Aerial photographs indicate these rows were planted as specified by Sasaki. Walkways from the employee parking to the building's canopied side entrances were lined by eastern red oak (*Quercus borealis maxima*). Closer to the lab, the podium and beds surrounding the visitors parking lot were to be planted with thousands of creeping juniper (*Juniperus horizontalis*), Andorra juniper (*Juniperus horizontalis plumosa*), Sargent's juniper (*juniperus c. sargenti*) and Pfitzer juniper (*Juniperus chinensis pritzeriana*). The junipers were to be planted in a diamond pattern similar to the eastern white pine. It's unclear if the juniper planting scheme was fully implemented. Photographs from the mid-1960s suggest that grass lawns were substituted for some of the areas designated for juniper plantings, especially near the main entrance on the north side of the lab, and the top of the podium was planted with hawthorn trees (*Crataegus*).[30]

Near the north spray pool, Sasaki placed clumps of Niobe willows (*Salix niobe*) and a border of Hatfield yew (*Taxus media hatfieldi*). Photographs document that willows and yew were planted as specified. The east and west side ponds, no longer extant, were to hold the greatest variety of plantings in a Japanese garden influenced arrangement, although it's unclear whether this was ever fully implemented since the ponds were removed in the mid-1980s and most photographs suggest a sparse number of plantings around the ponds, far fewer than specified by Sasaki. If Sasaki's scheme had been implemented there would have been artful arrangements of cockspur hawthorn (*Crataegus crusgalli*), eastern redbud (*Cercis canadensis*), flowering dogwood (*Cornus florida*), weeping Higan cherry *Prunus subhirtella pendula*), Niobe willow (*Salix niobi*) and eastern white pine (*Pinus strobus*). These less formal settings would have shaded the ponds and screened the parking lots, while the varying seasonal textures and colors offered visual interest throughout the year.[31]

Bell Labs occupied the new Holmdel facility in October 1961 with the arrival of its first 140 employees, and then held an official opening in September 1962 when over a 1,000 employees moved into the building. The lab, however, was only half built with the southern half and the interior courtyard unfinished. Also left incomplete at the end of Phase I was the outer belt road and the portion of the spray pool that was outside the ellipse. This work would wait until Phase II, which began in June 1964.[32]

Construction of Bell Laboratories, Holmdel, Phase II, 1964-1966. In 1964, Kevin Roche and John Dinkeloo were commissioned by Bell Labs to carry to completion the late Eero Saarinen's design, preparing construction plans and details for the Phase II expansion of the lab. From a landscaping perspective, most of the details had already been worked out by Sasaki, Walker and Associates near the end of Phase I in 1961 or 1962. It was merely a matter of constructing the

[30] Sasaki, Walker and Associates, Inc. and Eero Saarinen and Associates, Planting Plans and Details, Sheets 49-61 (May 1961) [ESC, Accession 2015-M-047, Box 1]; Bell Laboratories, Holmdel, Construction Photographs (1962-1967).
[31] Ibid.
[32] Bell Telephone Laboratories, Bell Laboratories Opens, New Holmdel, N.J., Facility, Press Release (December 5, 1966) [ESC, Series IV, Box 421].

outer belt road, the northern portion of the spray pool and the parking lots as planned, and then extending the planting schemes already established. One area that required some extra attention was the proposed lawn to the south of the main lab, which had been left barren at the end of Phase I in anticipation of further construction. One of the main considerations there was that the building's glassed-in, first-floor cafeteria wing, which was to look southward across a broad grass lawn to the perimeter trees lining Hop Brook beyond the perimeter road. Sasaki updated the planting scheme to frame the lawn with 56 flowering crab apple trees (*Malus hopa*), planted in two arcing rows to either side of the cafeteria. Aerial photographs indicate these trees were planted no later than 1970.[33]

A more serious landscaping challenge was the planting scheme for the interior garden courts of the completed lab. The lab was actually four separate blocks (two north and two south), separated by a cruciform-plan courtyard space housing the main reception, elevator shafts, lounges and interior garden courts, all enclosed within the glass curtain walls. The transverse courtyard, also sometimes described as an atrium, had skylights and a climate-controlled environment. In 1958, Saarinen had engaged landscape architect Dan Kiley of Charlotte, Vermont, to develop concepts for the interior garden courts. Kiley had envisioned a semi-tropical landscape with pools of aquatic plants, cypress and orange trees in large concrete planters that rose from the building's floor, and vines that could climb six-story trellises. These ideas were developed in a series of pencil sketches but had apparently been taken no farther at the time of Saarinen's death in 1961 with the exception of pouring the concrete for the planters at the same time that the atrium's foundation and floor had been constructed.[34]

When Roche and Dinkeloo reengaged with Phase II in 1964, it does not appear that Kiley was retained, but instead Sasaki, Walker and Associates came forward to prepare the final planting schemes for the courts. Much of Kiley's original scheme was dropped including the pools of aquatic plants, the climbing vines and the cypress and orange trees. Sasaki chose to fill the planters in the east and west ends of the entry courts with philodendron shrubs (*Philodendron selloum* and *Spathiphyllum "mauna"*) and Boston fern groundcover (*Nephrolepis exaltata bostoniensis*). Twelve-foot-diameter circular hanging baskets were suspended from the skylights and filled with kangaroo vine (*Cissus antarctica*). Between the two elevator shafts at the very center of the court, Sasaki placed two rows of Benjamin fig trees (*Figus benamina exotica*), a circular bed for seasonal plants, and four raised beds filled with bamboo palm trees (*Chamaedorea erumpens*), fiddleleaf fig trees (*Ficus pandurata*), birdnest ferns (*Asplenium nidus*), Japanese aucuba (*Aucaba japonica*), philodendron (*Philodendron selloum* and *Spathiphyllum clevelandii*) and a ground cover of grape ivy (*Cissus rhmobifolia mandaiana*), Boston fern (*Nephrolepis exaltata bostoniensis*) and oval-leaf peperomia (*Peperomia obtusifolia*). There were rumors that Saarinen's widow, Aline Saarinen, a well-known art and architectural

[33] Sasaki, Walker and Associates, Inc. and Eero Saarinen and Associates, Planting Plans and Details, Sheets 56 Addendum (May 1961, tracing updated to 1966) [ESC, Accession 2015-M-047, Box 1]; NETR, Aerial Photograph (1970).
[34] Dan Kiley, Holmdel Laboratories Courtyard Sketches (*circa* 1958) [ESC, Series IV, Box 417].

critic and journalist, was not pleased with the courtyard landscaping, particularly the hanging baskets. The baskets were supposedly removed for an opening she attended in December 1966. Bell Labs and Saarinen papers appear silent on the matter but there were obvious differences in the Kiley and Sasaki approaches to the courtyards with Sasaki's scheme lacking the dramatic verticality of Kiley's 40-to-60-foot-tall cypress trees and climbing vines. Sasaki's approach was perhaps the more pragmatic. The original courtyard plantings do not survive today.[35]

Landscape Changes and Additions, 1966-present. Even before Phase II was complete in 1966, there were hints of change in the Bell Labs, Holmdel landscape. A "heliport" (non-extant) not shown in original plans was placed in the northwest corner of the property. It was really little more than a gravel pad in the middle of a meadow. Aerial photographs document the addition of several softball fields (non-extant) in the meadows to the northeast and south of the ellipse no later than 1966.[36] At Murray Hill, sporting activities were important to employees and management felt it promoted teamwork and morale, but Saarinen and Sasaki appear to have either ignored or sought to discourage sporting activities at Holmdel. This prefigured one of the persistent if somewhat unarticulated shortcomings of the landscape, which was that no active recreation had been built into it. Whether it was the architects' intent or not, most Bell Labs employees and visitors considered the landscape a resource to be observed from their cars, but not explored on foot. The original plan had no walkways or trails other than those to and from the parking lots; there were not even sidewalks between the main lab building and the service building, forcing pedestrians to walk on the drives' grass shoulders or just merely strike out across the lawns and meadows. Most preferred to shuttle by car. During the 1970s, it was observed that the drives were sometimes clogged with joggers, a new exercise fad that was popular with Bell Labs employees. In the mid-1980s, Bell Labs finally responded to this need with construction of a wood-chip nature and exercise trail (Exer-Trail), which wound along the Hop Brook tributary to the northwest of the main labs.[37]

The introduction of the nature trail coincided with an expansion of the main lab building, which was planned by Kevin Roche John Dinkeloo and Associates in 1981 and constructed from 1982 to 1985. This project was termed Phase III, although it had not been part of the original Saarinen master plan. While the expansion of the lab was handled sympathetically by adding matching wings to the east and west ends, it necessitated the removal of the east and west ponds and any of its associated Japanese-inspired landscaping, which if it had been fully implemented was arguably among the most visually varied and interesting of the original Sasaki features from the

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[35] Sasaki, Walker and Associates and Eero Saarinen and Associates, Holmdel Laboratory Phase II, Plans of Courtyards, Sheets 347-349 (*circa* 1965) [ESC Accession 2015-M-047, Box 1]; Bell Laboratories, Holmdel, Color Slides (*circa* 1967), Kirby *et al*., 2016.

[36] National Environmental Title Research, Aerial Photograph 1966; Bell Laboratories, Holmdel, Color Slides (*circa* 1967-1985).

[37] AT&T Archives, *Holmdel 20th Anniversary*, Video (1982), on-line at www.techchannel.att.com/AT&T-Archives-Holmdel-20th-Anniversary [accessed January 2016]; Bell Laboratories, Holmdel, Color Slides *(circa* 1985).

first two phases. The east and west ponds were filled to make room for parking lots lost to the new additions. The visitors parking lot at the front of the building was also expanded resulting in removal or relocation of Sasaki's Niobe willows (*Salix niobi*).[38]

Perhaps to compensate for the loss of the two ponds, a new water feature was constructed to the south of the lab, replacing the lawn and flowering crab apple trees (*Malus hopa*) from the Phase II landscaping. This new pond, sometimes referred to as a "lagoon," had a Japanese garden aesthetic. Its asymmetrical amoebic-shaped plan featured two small islands. A wood-chip walking trail was placed around the pond's perimeter. According to plans, there were to be wooden footbridges to the islands and across two of the pond's arms, although it appears that only one bridge to the central island was built and the trail followed the pond's perimeter without crossing the arms. The edges of the lagoon were stabilized with stone riprap. Unfortunately, a list of original plantings for the lagoon area was not located during research but present-day plantings of mature trees are presumed to reflect the original planting scheme. These plantings included copses of weeping willow (*Salix baylonica*), dawn redwood *Metasequoia glyptostoboides*), London plane (*Platanus* ^{x} *acerifolia*), pin oak (*Quercus palustris*) and willow oak *Quercus phellos*) with hedge borders of burning bush (*Euonymus alatus*) and forsythia.[39]

2. Client, Architects and Builders

Bell Telephone Laboratories. Bell Telephone Laboratories was established in 1925 as a result of the consolidation of the engineering departments within the American Telephone and Telegraph Company (AT&T) and the Western Electric Company, the manufacturing arm of AT&T. The goal behind the creation of Bell Labs was to undertake research and design necessary to consolidate a national communications network and generate patents and new products through exploration of fundamental areas of science. About 4,000 scientists and engineers were assigned to the new Bell Labs, which had its headquarters in a former Western Electric manufacturing plant in Manhattan. Almost immediately, there were complaints about overcrowding, noise, vibration and electrical static interfering with research activities. In 1941, Bell Labs began moving its operations into a new suburban corporate campus at Murray Hill in Mountainside Borough, New Jersey, about 30 miles west of Manhattan. Murray Hill quickly became a center of wartime research with a staff of more than 8,000 before the end of World War II. Murray Hill played a significant role in the war effort with major technological breakthroughs in sonar, radar, electronic fire control systems and communications systems. After the war, Bell Labs moved its military projects to a suburban campus in Whippany, New Jersey, ten miles north of Murray Hill, while Murray Hill became the center for basic research efforts. New York City remained Bell

[38] Kevin Roche John Dinkeloo and Associates, Bell Telephone Laboratories, Holmdel, New Jersey, Addition, Phase III, Sheets A-1 to A-13 (1981) [ESC, Series IV, Box 650].
[39] Ibid.; Bell Laboratories, Holmdel, Color Slides (*circa* 1985), on file at Nokia Corporation Archives, Murray Hill, New Jersey.

Labs headquarters until 1959 when this too was moved to Murray Hill. The basic research at Murray Hill began paying dividends almost immediately with invention of the transistor in 1947-48 by the solid-state physics group that included future Nobel Prize winners William Shockley, Charles Townes and John Bardeen.

Bell Labs, Murray Hill functioned and looked very much like a college campus where scientists were encouraged to undertake independent research and interact with their colleagues within a set of large buildings that were centrally located within a pastoral setting. It was considered America's premier industrial research and development organization. In 1956, when Bell Labs commissioned Eero Saarinen to build a new campus at Holmdel, it was clear that Murray Hill was to serve as a model for Holmdel. In fact, Bell Labs wanted Holmdel to point the way into the company's postwar future much as Murray Hill had before the war, and they wanted an architect who would work closely with the company's engineers and scientists to build a facility that would express this optimism about technological and corporate progress. Specifically, Holmdel was to become the company's communications development center, while Murray Hill would continue to focus on basic research.

By the time Holmdel's Phase II was complete in 1966, Bell Labs operations were housed in 17 locations in ten states, with its three largest facilities – Murray Hill, Whippany and Holmdel – located in New Jersey. In 1967, when 4,200 employees moved into the newly expanded Holmdel facility, it became Bell's largest laboratory. During the 1960s and 1970s, Holmdel's main focus was in the development of electronic switching systems, from massive central station equipment to top-secret military systems and consumer products such as push-button phones. There were also important developments in wireless technology, particularly in satellite communications. Holmdel opened with great promise and made significant achievements in communications technology during the 1960s and 1970s, but the breaking up of AT&T and the Bell Telephone system in 1984 marked the beginning of major changes at Bell Labs and some uncertainty about its future within the changing corporate structure of its parent companies. In 2006 Alcatel-Lucent closed Holmdel and consolidated its operations with those at Murray Hill.[40]

[40] Bell Telephone Laboratories, Bell Telephone Laboratories, Press Release (December 1966) [ESC, Series IV, Box 421]; Prescott C. Mabon, *Mission Communications: The Story of Bell Labs* (Murray Hill, New Jersey: Bell Telephone Laboratories, Inc., 1975); Deirdre LaPorte, "Bell Laboratories: The Beginnings of Scientific Research in an Industrial Setting," *Annals of the New York Academy of Sciences,* Volume 412 (October 14, 1983), pp. 85-100; Knowles and Leslie (2001), pp. 19-28; Alcatel-Lucent, *History*, electronic document at www.bell-labs.com/about/history-bell-labs (2016) [accessed January 2016]. Paradoxically, the older Murray Hill facility, with many additions and a chaotic plan, proved more long-lived than Holmdel. While there were certainly many factors in the decision to close Holmdel, there was a feeling of ambivalence about the campus and its functionality as a research lab. Technological historians Scott Knowles and Stuart Leslie interviewed former employees who described Holmdel as "monumental, impersonal, inward looking, and self-contained" (p. 28). From the standpoint of architecture, most Bell Labs staff felt the main lab building at Holmdel prevented internal communications. The landscape too failed to provide as many opportunities as Murray Hill did for human interaction.

Eero Saarinen and Associates. Finnish-born architect Eero Saarinen (1910-1961) immigrated to the United States in 1923 at age 12 with his famous architect father, Eliel Saarinen (1873-1950). The young Saarinen came of age at the influential Cranbrook Academy of Art in Bloomfield, Michigan, where his father took charge of the Architectural Office. There Eero embraced arts, crafts, furniture making and sculpture, as well as architecture, often working alongside his father. The elder Saarinen also had a reputation as an urban planner with an interest in integrating architecture with transportation systems and landscapes, which would influence his son's understanding of architectural practice.

Aspiring to be an artist, Eero traveled to Paris in 1929 to attend the Académie de la Grande Chaumière; however, in 1931, he returned to the United States and enrolled at Yale University's School of Architecture. After graduating from Yale in 1934, Eero undertook a two-year trip through Europe and the Middle East to study architecture, developing a keen understanding of Western architectural traditions as well as Europe's burgeoning Modernist architectural movement. In 1936, he returned to Cranbrook to work with his father. Together they won several design competitions, including one for the Smithsonian Art Gallery, and important commissions, among them master plans for workers' housing for World War II defense plants. In 1948, Eero won a national competition for the Jefferson National Expansion Memorial in St. Louis, making a name for himself independent of his father, who would die two years later. The centerpiece of the St. Louis memorial plan, a 590-foot-high, stainless-steel catenary arch, known as the Gateway Arch, was not executed until 1964.[41]

Beginning in the late 1940s and continuing until his death in 1961, Saarinen amassed an incredible architectural legacy. Among the highlights are: the Kresge Auditorium and Chapel at the Massachusetts Institute of Technology, Cambridge (1950-1955); the Milwaukee War Memorial, Milwaukee, Wisconsin (1952-1957); Concordia Senior College, Fort Wayne, Indiana (1953-1958); the University of Chicago Law School, Chicago, Illinois (1955-1960); the United States Chancellery Building, Oslo, Norway (1955-1959); the United States Chancellery Building, London, England (1955-1960); the Trans World Airlines (TWA) Terminal, New York, New York (1956-1962); Morse and Stile College, Yale University, New Haven, Connecticut (1958-1962); Dulles International Airport, Chantilly, Virginia (1958-1963); North Christian Church, Columbus Indiana (1959-1964); and the Columbia Broadcasting System (CBS) Headquarters, New York, New York (1959-1965).

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[41] For Saarinen's influences and education, see Jayne Merkel, *Eero Saarinen* (London: Phaidon Press Limited, 2005), pp. 14-67, and Vincent Scully, "Rethinking Saarinen" in Eeva-Liisa Pelkonen and Donald Albrecht, eds., *Eero Saarinen, Shaping the Future* (New Haven: Yale University Press, 2006), pp. 13-43. Saarinen himself expressed his understanding of the development of Modernist architecture and the influences of Wright, LeCorbusier, Gropius, Miles van der Rohe, Nervi and Fuller in Eero Saarinen, "The Six Broad Currents of Modern Architecture, *Architectural Forum*, Volume 99, Number 1 (July 1953), pp. 110-115.

Among Saarinen's most important commissions were corporate campuses, beginning with the General Motors (GM) Technical Center in Warren, Michigan (1948-1956). The GM job was actually won by Eliel Saarinen in 1945 but by the time GM was ready to begin work Eero was fully in charge. The GM Technical Center was designed at an automobile scale, befitting the client, and the landscape and the buildings were designed to be seen as one drove around the campus. Man-made water features, plantings and a sculptural quality to functional objects such as outdoor lighting and a water tower were used to enhance the overall architectural composition of the technical center. These techniques would be used in the design of Saarinen's other important corporate campuses – the IBM Manufacturing and Administrative Center in Rochester, Minnesota (1956-1958); the IBM Thomas J. Watson Research Center in Yorktown, New York (1956-1961); the Deere and Company Headquarters, Moline, Illinois (1956-1964); and the Bell Telephone Laboratories Holmdel, New Jersey (1959-1966). Each project, although clearly drawing upon the experience with GM, featured refinements designed to fit the campuses into the natural topography and the particular needs of the clients. Saarinen was known to "reinvent the wheel" with each project, reexamining assumptions and appropriateness.[42]

To keep up with the pace of work, Eero Saarinen formed Eero Saarinen and Associates in 1950. By the early 1950s, the office was employing 40 people. Kevin Roche, chief of design, coordinated the efforts of the design architects, who worked extraordinarily long hours. With the GM project underway, the firm moved from Eliel's former office at Cranbrook to a new office in Bloomfield Hills, Michigan, designed by Saarinen in 1953 and a modest version of the GM laboratory building at the technical center. Saarinen was described as involved in almost every detail of his projects but he did delegate and encourage "something like the scientific method of trial and error – with many, many trials."[43] His collection of papers and drawings, now housed at Yale University's Sterling Memorial Library, are a rich source of information on how Saarinen's projects evolved, including the numerous studies for Bell Laboratories, Holmdel. It is also clear from Saarinen's collected papers that his associates played key roles in the Bell Labs project. Specifically, architect John Dinkeloo developed the water tower design and the glass curtain walls, and architect Ross W. Pursifull oversaw the architectural aspects of the project during construction. Pursifull, who was based in New York City, reported back to the Saarinen offices in Bloomfield Hills with frequent progress updates and hundreds of communications and requests for information from the Western Electric engineers who served as on-site project managers.[44]

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[42] Walter McQuade, "Eero Saarinen, A Complete Architect," *Architectural Forum* (April 1962), pp. 102-119; Maude Dorr, "Portraits in Architecture: A Review of the Most Recent Buildings of the late Eero Saarinen," *Industrial Design,* Volume 10, Number 5 (May 1963), pp. 62-71; Aline Saarinen, ed., *Eero Saarinen and His Work,* Revised Edition (New Haven, Connecticut: Yale University Press, 1968), pp. 30, 76-80, 82; Rupert Spade, *Eero Saarinen* (New York: Simon and Schuster, 1971); Merkel (2005), pp. 89-101; Pelkonen and Albrecht (2006), pp. 275-285.
[43] Merkel (2005), p. 75.
[44] Ibid., pp. 75-81.

Among the young Modernist architects who emerged during the 1930s to 1950s, Eero Saarinen was considered unusual for his respect for historical precedents and his willingness to seek out forms appropriate to "the spirit of a place" rather than imposing Modernist forms based on an aesthetic ideology. He proved extremely versatile whether the commission was for a church, school, office building, auditorium, sports arena, airport or museum. He also earned a reputation for his willingness to tailor his architecture to the practical and symbolic needs of his clients. The process of careful site analysis and collaborative study through which Saarinen developed his many projects exhibited a consistent approach even as the projects themselves were quite varied and site and client specific. Bell Labs, Holmdel was no exception.[45]

Sasaki, Walker and Associates. Hideo Sasaki (1919-2000) is recognized as one of America's most influential landscape architects of the 20th century. He was born in the town of Reedley near Fresno, California where his Japanese parents owned and worked a small family farm. His older brothers were required to assume farming responsibilities from an early age, but Sasaki, being the youngest son, was afforded opportunities to go to school and seek out a career other than farming. He graduated from Reedley Junior College in 1939, then matriculated to the University of California, Los Angeles (UCLA) where he intended to study business administration. After learning about the possibility of studying to be a city planner, he transferred to the University of California, Berkeley, where planning was offered in the department of landscape architecture. His education was interrupted in 1941 when he and his family were interned in a camp for Japanese-Americans in Colorado. After the war, Sasaki returned to college, this time at the University of Illinois in Urbana, where he earned a bachelors degree in landscape architecture in 1946 followed by a master's degree from Harvard University in 1948.

Over the next several years, Sasaki worked for architects Skidmore, Owings and Merrill (mostly designing landscapes for urban renewal and housing projects), did research on housing and urban renewal around Chicago, and taught at the University of Illinois and at Harvard. In 1953, he opened a "one-man" office at his home in Watertown, Connecticut while taking a greater role in teaching and curriculum development at Harvard's Graduate School of Design. During this period, he gained a reputation as a collaborator, willing to work on multi-disciplinary teams and solve whatever problems were presented. The line between his teaching and his own professional practice was blurry, particularly as he used his practice to provide experiences and employment for his students. Sasaki hired his first employee in 1954 and in 1958 he promoted one of his most promising students, Peter A. Walker, to a partner in Sasaki, Walker and Associates. In 1959, Walker moved to San Francisco to open a West Coast office. By this time, Sasaki had a national reputation for his collaborative work on major architectural and planning projects including Boston's Government Center with architect Kevin Lynch; Sea Pines Plantation on Hilton Head

[45] Andrea O. Dean, "Eero Saarinen in Perspective," *AIA Journal*, Vol. 70, No. 13 (1981), pp. 36-51, and Carter Wiseman, *Shaping a Nation* (New York: W.W. Norton & Company, 1998), pp. 198-201. Although there are many architectural history surveys to place Saarinen in the context of the Modernist architecture movement, this is one of the more readable and insightful. Dean's article in *AIA Journal* offers many quotes from Saarinen's contemporaries and later architects influenced by his work.

Island, South Carolina with developer Charles Fraser; and the Upjohn Corporation World Headquarters in Kalamazoo, Michigan, with architects Skidmore, Owings and Merrill. Sasaki spread his influence widely through his former students and collaborators. Sasaki, Walker and Associates was foremost in developing "a flexible, pragmatic approach to landscape design and planning that could accommodate both modern and traditional buildings."[46] The firm grew and eventually developed a corporate-like organizational structure that some consider the first of its type in the practice of professional landscape architecture in the United States. Sasaki, Walker and Associates, renamed SWA Group in the 1970s, continues today as a significant international firm in the fields of landscape architecture, urban design and planning .[47]

While it may seem second nature today for landscape architects to integrate land, buildings and the larger environment, these ideas were considered revolutionary in the 1950s, especially in the context of Modernist architecture. It seems to be just this perspective that Sasaki brought to his projects with Saarinen even though Saarinen was already himself well-attuned to working with integrated teams of professionals. Saarinen appears to have initiated contact with Sasaki during 1957 while planning IBM's Thomas J. Watson Research Center in Yorktown Heights, New York. The highlight of Sasaki's contribution to the IBM project was a Japanese-inspired garden spanned by footbridges connecting the building to its raised parking lot. During 1957, Saarinen also received the commissions for Bell Laboratories, Holmdel and the Deere and Company Administrative Center, inviting Sasaki to collaborate on those landscape plans as well.[48]

Sasaki delegated much of the detail for the Bell Labs and Deere projects to one of his talented students, Stuart O. Dawson (1935-). Dawson signed and checked the landscape drawings for Bell Labs, and is credited in Sasaki histories as being the most involved of Sasaki's students. Dawson received a master's degree from Harvard in 1958 and began working for Sasaki while he was a student, near the time the Bell Labs project was getting underway. Dawson, commenting on Sasaki's management style, stated that Sasaki would work with his students and associates to develop a vision – usually defined in terms of colors, textures and some details. Sasaki would then leave them alone to detail the work, expecting they would do a good job. Dawson provided the details for the Bell Labs master plan set down by Saarinen and Sasaki. In 1964, Dawson became a principal in Sasaki, Walker and Associates. Notable examples of Dawson's later work included the Modernist plaza and fountain at the Christian Science Center,

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[46] Peter Walker and Melanie Simo, *Invisible Gardens: The Search for Modernism in the American Landscape* (Cambridge, Massachusetts: MIT Press, 1994), pp. 234.
[47] Jan C. Rowan, "Design of Exterior Spaces," *Progressive Architecture* (July 1960), pp. 108-126; Walker and Simo (1994), pp. 224-235; Melanie Simo, *Sasaki Associates, Integrated Environments* (Washington, D.C.: Spacemaker Press, 1997), pp. 7-10, 98-101; Melanie Simo, *The Offices of Hideo Sasaki, A Corporate History* (Berkeley, California: Spacemaker Press, 2001), pp. 9-26; Melanie Simo, "Sasaki, Hideo (1919-2000), Landscape Architect, Educator", in Charles A. Brinbaum and Stephanie S. Foell, eds., *Shaping the American Landscape: New Profiles from the Pioneers of American Landscape Design* (University of Virginia Press, 2009), pp. 301-304.
[48] Pelkonen and Albrecht (2006), pp. 207-210.

Boston (1973) and Christopher Columbus Waterfront Park, also in Boston (1974-76), which is considered among the nation's first revitalized waterfronts.[49]

Frank Briscoe Construction Company. The Frank Briscoe Construction Company of Newark, New Jersey, served as the general contractor for Bell Labs, Holmdel, overseeing the work of more than 200 sub-contractors who provided a variety of services from electrical to landscaping. Briscoe was established in 1920 and emerged during the middle decades of the 20th century as a major construction company in the northern New Jersey area with projects that included expansions to Newark Airport (1948) and construction of the Meadowlands sports complex in East Rutherford, New Jersey (1976). In the late 1970s or early 1980s, Briscoe, described as a closely held company, was unable to meet financial obligations and faced bankruptcy. Its assets were pledged as security to the Travelers Indemnity Company. Briscoe eventually defaulted on its loan.[50]

3. Historical Development of the Postwar Corporate Campus

Eero Saarinen's corporate campuses were trend-setting designs and landscapes that broke the past mold of major American companies headquartering their corporate executives and technical staff in central business districts or in factories. The business strategy of suburbanizing corporate America was driven by demographic, economic and geographic imperatives. Perhaps first and foremost was the imperative of the automobile and improved highways, which made suburban living attractive to increasing numbers of middle-class Americans who filled the ranks of white-collar workers. Large suburban houses were attractive to top-flight executives and professionals, like the scientists who worked for Bell Labs. This demographic shift to the suburbs had started in the 1920s and 1930s but gained full steam in the late 1940s and 1950s. Owning land and buildings in the suburbs was also supported by corporate investors who proved willing to finance the costly campuses. The cost of Bell Labs Holmdel, for example, was approximately $50 million, roughly $400 million in today's money, adjusted for inflation.[51]

Based on the work of Saarinen and other architects, notably Skidmore, Owings and Merrill and Voorhees, Walker, Foley and Smith, by the mid-1960s a distinctive type of Modernist corporate campus had taken shape. Generally, the spatial organization of these campuses featured a centrally located Modernist office building within a casually landscaped pastoral-appearing

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[49] Simo (2001), pp. 34-35; The Cultural Landscape Foundation, "Pioneers: Stuart O. Dawson" (2015), electronic document, on-line at www.tfic.org/pioneer/stuart-dawson [accessed February 2016]; SWA Group. *History*. On-line at www.swagroup.com/about-us/history/ [accessed January 2016].

[50] *Frank Briscoe Co., Inc. v. Travelers Indem. Co.*, 899 F. Supp. 1304 (D.N.J. 1995), electronic document, on-line at www.law.justia.com/cases/federal/district-courts/FSupp/899/1304/1670635 [accessed February 2016].

[51] Eero Saarinen and Associates, Bell Laboratories, Holmdel, Project Description (1966) [ESC, Series IV, Box 42].

landscape. Other features included grand entry drives to take visitors to reception lobbies at the building's main entrance, which was usually set off by more formal planting beds and a passenger drop-off; prominent water features, often featuring fountains; and large parking lots, typically screened from view by rows of trees. This formula was repeated in countless examples throughout America's suburbs during the 1970s to the present, although imitation rarely achieved the same impact as the innovative examples of the immediate postwar years.

Architectural critics and historians have used a variety of terms to describe the postwar suburban corporate campus, including corporate estate, corporate villa, pastoral capitalism and industrial Versailles. These terms place the corporate campus paradigm within several landscape traditions including English estates, grand European palaces and American universities. Comparisons are easy to make since these all tend to feature architect-designed buildings within well-ordered landscapes, whether those landscapes are formal or casually picturesque. All historians seem to agree, however, that the corporate campus was a product of its own time and influenced by the expansion of American corporate capitalism in the postwar years.

Much as a skyscraper could be viewed as a symbol of corporate power within the urban landscape, the corporate campus came to be viewed as a symbol within a suburban context. "The aesthetic strategy of the new headquarters was part of managerial imperatives of the corporation, especially the careful orchestration of corporate image."[52] Many observers tended to see the campuses as expressions of power, or at the very least of corporate wealth and prestige, and in some cases, as with Bell Labs, as an expression of technological expertise and scientific knowledge. The architecture and landscape of the corporate campus provided opportunities for corporations to commission the work of Modernist architects, and thus also establish themselves as significant patrons of culture, which could then be used to burnish corporate image. Bell Labs most certainly took every opportunity to publicize the Holmdel campus as a significant architectural achievement that meshed with its self-image as a national center for technological innovation.[53]

[52] William H. Tishler, ed., *American Landscape Architecture, Designers and Places* (Washington, D.C.: The Preservation Press, 1989), pp. 150-153; Louise A. Mozingo, *Pastoral Capitalism: A History of Suburban Corporate Landscapes* (Cambridge, Massachusetts: MIT Press, 2011), p. 102.
[53] Ibid., pp. 101-147.

PART II. PHYSICAL INFORMATION

A. Landscape Character and Descriptive Summary

Bell Laboratories, Holmdel is a 460-acre corporate campus located within New Jersey's Coastal Plain physiographic province approximately 15 miles west of the Atlantic Ocean. Low rolling hills, sandy soils and small streams with dendritic drainage patterns characterize the immediate vicinity of the campus. Elevations range between 100 and 160 feet above sea level with the property generally sloping from northeast to southwest. Hop Brook, a minor tributary within the Navesink River watershed, drains the site with the brook forming the campus's southern boundary. Two unnamed branches of Hop Brook have their sources in a range of low hills to the north of the campus. The tributaries flow across the site forming two small northeast-to-southwest trending valleys.

The setting is suburban in character with the prevailing form of surrounding development being post-1950s residential subdivisions of single-family homes in neighborhoods with curvilinear street patterns. There are still some pockets of agricultural activity characterized by cultivated fields and tree nurseries, particularly to the south of Bell Labs. The campus is approximately one-half mile south of the Garden State Parkway, which is this area's principal arterial highway. The parkway provides access to New Jersey's Atlantic shore communities to the south and to urban areas of northern New Jersey and New York City to the north. Holmdel is approximately 45 miles by car from downtown Manhattan.

The Holmdel campus is bounded to the north by Crawfords Corner Road, to the west by Roberts Road and to the east by Middletown Road. These roads predate the campus. To the south, the campus is bounded by Hop Brook, a tree-lined stream within a small valley that is approximately 20 to 30 feet below the elevation of the main part of the Bell Labs campus. The campus itself is contained within open fields and wooded perimeters that tend to be defined by the natural drainages. The fields and woods are not formally landscaped.

The landscaped part of the campus is symmetrically arranged along a primary northeast-to-southwest axis with the northeast end at Crawfords Corner Road and the main lab building located near the southwest end of the axis. At Crawfords Corner Road, visitors to Bell Labs enter the campus near its highest elevation. The main entry esplanade road, approximately 3,000 feet long, slopes gently down to the lab building. A secondary northwest-to-southeast axis is oriented at right angles to the primary axis with secondary entrance drives to the western (Roberts Road) and eastern (Middletown Road) edges of the site.

The site's asphalt-paved drives are curvilinear, creating a pattern that has been described as a "keyhole" design due to its similarity to the end-on profile of an old-fashioned skeleton key. The outer edges of the drives are delineated by mature trees, mostly sugar maples, which are planted in allées. At the center of the keyhole pattern is an elliptical belt road with its long axis oriented

northwest to southeast. Within the keyhole, the landscape becomes more formal with lawns, plantings, man-made water features, a Japanese-style garden and parking areas, contrasting with the meadows and wooded perimeters outside the keyhole.

The Bell Laboratories building is located at the center of the ellipse. The building has a 1,000-foot-by-360-foot rectangular plan with the long axis oriented to the secondary northwest-to-southeast axis of the site. The lab's main entrance and entry court is centered on the primary axis and located on the north (front) elevation. There are three reflecting pools along the primary axis, two to the front and one to the rear of the building. The front pools are known as the "spray pool" and the rear pool is known as "the lagoon." There were once two other ponds to the east and west ends of the ellipse, but these were filled in for parking when the building was expanded in 1982-85.

Among the campus's secondary structures and buildings are a water tower, a former radio range building, and a service building and sewage treatment plant. Of the three, the water tower is the most conspicuous, located on the primary axis near the main entrance at Crawfords Corner Road. The tower has a sculptural quality with uniquely shaped tank and legs. The radio range building is a 70-foot-by-80-foot, one-story, flat-roof, concrete-block building located outside the northwest side of the belt road. This building served a 1,500-foot-long waveguide radio antenna field, which was located to the northwest of the building and is currently a meadow.

At the southwestern end of the campus outside the belt road is a support complex of assorted service and specialized lab buildings and structures screened from the rest of the main campus by an earthen berm and a dense planting of trees. The largest of the buildings is a 340-foot-by-140 foot, one-story, flat-roof, concrete-block service building that was built as part of the original Phase I construction of 1959-1962. There was also a sewage treatment plant and electric transformer yard as part of the Phase I construction although these two facilities have since been replaced or significantly updated. Over the years, other buildings and structures were constructed to meet environmental requirements or specific operational needs. Today, the complex includes the main service building (1959-62), electric transformer yard and substation structure (1959-62), emergency generator building (*circa* 1985), lab clear waste treatment plant (*circa* 1985), lab clear waste pretreatment plant (*circa* 1985), ocean simulation facility (*circa* 1970), wastewater pump station (*circa* 1990), bioxide odor control tank (*circa* 2000), earth station building (*circa* 1985), roadway and sand storage building (*circa* 1975), outside area test site (*circa* 1985), and chemical and pesticide storage building (*circa* 1985). East of the support complex and just outside the ellipse is a cooling tower/electric room building nestled against a treed hill. This building was constructed in the mid-1980s as part of the Phase III expansion.[54]

[54] Utility Exhibit Plan, Lots 38, 38.02, 73.01, 73.02, 73.03 & 73.04, Block 11, Lucent Technologies, LGA Engineering, Delineated by John W. Massey Inc., April 4, 2006.

B. Character-Defining Features

1. Natural Features

The site is defined by natural topography and features as were observed and retained by Eero Saarinen and Hideo Sasaki in their initial site reconnaissance and master plan. Namely, they chose to center the "keyhole" between two branches of Hop Brook allowing the naturally tree-lined streams to form a perimeter on the east, west and south sides of the site. Sasaki noted on plans that the trees lining the streams were to be retained. No major landscaping activities took place to channelize or otherwise alter the course of the streams. Areas adjacent to the streams, which had been agricultural fields or antenna fields prior to 1959, were maintained as meadows, retaining the open feeling associated with an agricultural landscape. In some areas, successional trees have been allowed to grow within the former meadows.[55]

The keyhole's primary northeast-to-southwest axis roughly follows a low natural divide separating the two branches of Hop Brook. Saarinen took advantage of the natural northeast-to-southwest slope of the site by placing the site's main entrance at the northwest end of the primary axis about 45 feet above the elevation of the lab's first floor. The six-story lab with its massive, reflective-glass curtain wall is placed nearly 3,000 feet to the southwest of the entrance. This use of natural elevation enhances a sweeping view of the lab. The lab's mirrored-glass walls reflect the landscape back at visitors as they approach the building. In reverse, the primary view from the lab's front elevation looks northwest back along the main entrance through a tree-lined allée framing the low-rising hills to the north beyond the campus.

2. Designed Features

Land Use (spatial organization). Spatial organization is based on a bi-axial plan with the primary axis placed northeast-to-southwest and a secondary axis placed at right angles northwest-to-southeast. The main lab building is located at the center of the plan where the two axes cross with the main entrance facing northwest along the primary axis. Drives, man-made water features, plantings and parking lots are symmetrically arranged along the axes.

Traffic Circulation and Parking. Circulation through the campus is provided by a system of drives, most of which are one-directional with turning lanes to reduce cross traffic at intersections. These asphalt-paved drives, collectively known as Bell Laboratories Road, are character defining, forming the outline of the keyhole pattern and delineating the formal landscape inside the keyhole from the less formal pastoral landscape outside the keyhole. The components of the circulation system are a main north esplanade road on the primary axis (access via Crawfords Corner Road), east and west entrance drives on the secondary axis (access via Middletown Road and Roberts Road), and an elliptical belt road, composed of an outer and

[55] Sasaki, Walker and Associates, Inc. and Eero Saarinen and Associates, Planting Plans and Details, Sheets 49-61 (May 1961) [ESC, Accession 2015-M-047, Box 1].

inner ring, which circle the main lab and its parking lots. There are also U-plan drives at the main entry and the side entries for dropping off passengers. Two service drives flank the lab. The service drives dip below grade to provide access to the building's first-floor service entries. The service drives were bridged by the building's new wings in 1982-85 making them more tunnel-like. All drives have asphalt-paved travelways with pavement edges flush with grass shoulders. There are no sidewalks or curbs except within the parking areas inside the ellipse.

Saarinen's original plans and construction photographs indicate the drives were lit by two types of approximately 4-foot-high metal lighting standards, which were designed by Saarinen in the Modernist style. One type had tapered legs and a slightly peaked, disc-shaped shade while the other had a triangular-section metal leg with a cantilevered, scoop-shaped shade, somewhat in the same form as the water tower at the main entrance. Both kinds of lights were used to line the drives with the shades directing light downward to illuminate curbs, medians and shoulders. Parking lots were illuminated by approximately 20-foot-tall monopole lights.[56] None of the original Saarinen lighting fixtures were noted during field inspections in August 2015. At present, three types of lights are typically found on the campus: a 10-foot-tall, metal square-section light standard with box-shaped luminaire at roadway intersections, a 3-foot-tall box-shaped bollard light along concrete walkways in the parking areas, and another type of 10-foot-tall, metal square-section light standard with cantilevered box-shaped luminaire in the parking lots. These lighting fixtures appear to date from the mid-1980s. Uplights were added to every maple tree along both sides of the entry drives in 2014-2015.

The main north esplanade road is composed of two divided lanes (one for entering and one for exiting the campus) and a system of crossovers at Crawfords Corner Road to control the one-way movements. The divided lanes are separated by about 1,400 feet along Crawfords Corner Road but taper toward each other to close within 50 feet just to the southwest of the water tower. The impact of this tapered roadway plan is to make the water tower a focus of attention upon entering the grounds but as motorists pass the water tower and swing into line with the primary axis of the campus the massive main lab building is brought into view and becomes the center of attention. Southwest of the water tower the esplanade drives gradually diverge eventually separating by 600 feet to pass around the spray pool located before the lab's visitor entrance and lobby.

The ellipse is defined by an outer belt road (counter-clockwise traffic flow) and an inner belt road (clockwise traffic flow) with the two rings separated by a grass median of approximately 150-foot width. U-turn lanes link the outer and inner rings roads. The U-turn lanes occur at varying intervals of about 400 to 700 feet. The ellipse is elongated, measuring approximately 2,825 feet wide from northwest to southeast and 2,000 feet wide from northeast to southwest.

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[56] Western Electric Company, Inc., Holmdel Laboratories, Construction Photographs, 1959-1966. Nokia Corporation Archives, Murray Hill, New Jersey.

The southeastern and northwestern thirds of the inside of the ellipse are almost entirely paved as employee parking areas. Tree-lined allées and grassy traffic islands define through lanes and sidewalks. Traffic and pedestrians are directed toward the lab's canopied eastern and western entrances. All of the parking spaces are painted at about a 30-degree angle to the site's secondary axis, which serves to reinforce the keyhole pattern.

Constructed Water Features. As currently configured, the Bell Labs campus has three constructed water features, two to the front (northeast) of the main building known as the spray pool and one to the rear (southwest) known as the lagoon. The two to the north were part of the original Saarinen/Sasaki landscape master plan and were constructed from 1959 to 1966, but the one to the south was added in 1982-1985. Two other pools, known as the east and west ponds, were located at the northwestern and southeastern ends of the ellipse until 1982. They were filled to create additional parking when the lab building was expanded.

The two pools to the front of the building are placed along the site's primary axis and are separated by the belt roads. The outer northeastern-most pool is shaped as a half-ellipse with a width of approximately 500 feet and a radius of approximately 310 feet curving away from the building. The inner southwestern-most pool is approximately 420 feet by 570 feet and curves toward the building on its southwestern side. According to original site plans, the pools are approximately 6 feet deep with clay linings and stone riprap bank protection.[57]

The pond to the rear of the building, also known as the lagoon, was constructed in 1982-85 in an area that the original Saarinen/Sasaki plan had designated as a broad grassy lawn bounded by arcing rows of crab apple trees to frame the view from the lab's one-story cafeteria wing. The lagoon has an amoebic-shaped perimeter and a central island and one side island (although sedimentation now mostly connects it with the perimeter). Although the lagoon is centered along the campus's primary northeast-to-southwest axis, it departs from the overall symmetry of the plan. A footpath follows the lagoon's perimeter and there is a footbridge to the central island. Plantings around the lagoon indicate a Japanese garden influence.

Plantings. The original Sasaki planting scheme within the keyhole was symmetrically reflected across the primary axis of the site. Many elements of this planting scheme remain intact today including the original lawns, tree-lined allées, podium planting beds adjacent to the lab building, and copses of trees to provide screening for service buildings and to mark the locations of former farmhouses. The mature sugar maple, red maple, eastern red oak and eastern white pine originally selected by Sasaki continue to be among the most dominant species. Eastern white pines, originally planted in the hundreds, are fewer in number, probably because they grew so quickly and needed to be thinned, but they still provide a screen between the building and its parking lots.

[57] Eero Saarinen and Associates, Holmdel Laboratory, Site Plan Sepias (1959) [ESC, Series IV, Box 419].

Many of the diseased or missing maples trees along the entry drives have recently been replanted. Somerset Properties, the new owner, has up-lit every maple tree with a ground-level light. The top of the podium is planted with hawthorn trees instead of the low-growing juniper indicated by original Sasaki plans and Bell Labs photographs of the early 1960s. These Hawthorns appear to have been planted in the 1980s. There are many other changes to the original planting scheme, mostly related to the natural aging of the landscape or the expansion of the building in 1982-85. These differences include removal of the east and west ponds and their associated plantings and the expansion of the visitor and employee parking lots resulting in the removal of planting beds and lawns.

The creation of the lagoon to the south of the main lab in 1982-85 provided an opportunity to arrange plantings in a Japanese-garden inspired style. A focal point is the central island planted with weeping willow trees (*Salix baylonica*), which are also scattered around the southern edge of the lagoon. Other plantings around the lagoon include: copses of dawn redwood trees (*Metasequoia glyptostroboides*) on the other island, the eastern peninsula, and the southern end of the footbridge; a copse of London plane trees (*Platanus x acerifolia*) at the southwest edge of the lagoon; a copse of pin oak trees (*Quercus palustris*) at the southern corner of the lagoon; and a copse of willow oak trees (*Quercus phellos*) at the western corner of the lagoon. A hedge of burning bush (*Euonymus alatus*) borders the lawn surrounding the lagoon, and there is a forsythia hedge along the lagoon's northwest edge. White pine trees, part of the original Sasaki planting scheme separate the lagoon area from the flanking parking lots. Another copse of dawn redwood trees (*Metasequoia glyptostroboides*) grow east of the northern spray pond just beyond the maple allée. The redwoods appear to have been planted at about the same time as those at the lagoon in the early to mid-1980s.[58]

Outside the keyhole there are some huge specimens of oak trees, probably dating back to the farms that occupied the site prior to Bell Labs. There are also the remnants of an apple orchard (*Malus* species) in the southwest corner of the site (south of western entrance road and west of the parking lot). The forests outside the keyhole contain a mix of native trees (oak, linden, maple, hickory, pine, spruce, sweet gum, cherry, black gum, persimmon and sumac) and introduced exotic/native trees (tree-of-heaven, Bradford pear, mulberry and zelkova).

Walkways and Trails. Walkways and trails were not a major component or character-defining feature of the original Saarinen/Sasaki plan. Once arriving at the parking lots, visitors and employees were directed through a limited number of sidewalks to the building's entrances. Pedestrian circulation was given far more attention within the building including an innovative approach of placing the hallways along the perimeter of the building and within the courtyards. Saarinen considered this arrangement to cut down on the walking employees would need to do to travel to nearby offices and labs within their assigned work units.

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[58] Christopher M. Stevens, personal communication, 8 March 2016. Regarding identification of plantings surrounding the lagoon.

The lack of outdoor walkways and trails was noted in later years with some attempts to add them as amenities for employees. A walkway was designed around the new lagoon about 1985, which afforded employees a place to walk during their lunch breaks. A combined nature/exercise trail was constructed at about the same time along the branch of Hop Brook to the northwest of the ellipse. The trail is now overgrown and difficult to access. It begins at the north edge of the outer belt road and follows the central branch of Hop Brook northward to near Crawfords Corner Road before circling back along the opposite bank of the stream. The branch is dammed near the outer belt road, which creates a wetlands environment upstream.

Buildings and Structures. The lab building has always received the most attention from architects and historians. It is the central, dominating, character-defining feature of the site. The original section is a reinforced-concrete frame structure that was built in two phases from 1959 to 1966, while the east and west ends of the building are steel-frame wings built from 1982 to 1985. The building is rectangular in plan, measuring 1,000 feet by 360 feet, and six stories high, although appearing only five stories above grade on its primary (north) elevation. The Modernist-style office building has the massing and minimalist design characteristics associated with mid-20th-century architectural trends. Its exterior is essentially a large glazed box centered on a plinth-like concrete base, which Saarinen referred to as a podium, originally planted with low-growing junipers and later planted with hawthorn trees (*Crataegus*). The glass curtain walls consist of mirrored-glass panels set within aluminum frames with projecting fins. Saarinen intended for the mirrored-glass to reflect the surrounding landscape. At night, however, the glass becomes transparent offering views of the building's interior. Canopies cover centered entrances on the north, east and west elevations.

The building's interior is composed of four interior blocks, referred to by Saarinen as lofts, which are separated by a large cruciform-plan, five-story atrium. The floors between the lofts are linked by skybridges. The atrium is covered by skylights. The floor of the northwest-southeast axis of the atrium is symmetrically arranged with a circular fountain located at each end of the axis. From a landscape perspective, the atrium offered an opportunity for introducing semi-tropical and seasonal plantings, which are documented in original Saarinen/Sasaki landscape plans, but at the time of the HALS documentation the building was undergoing redevelopment and had been vacated by Bell Labs for nearly a decade. The interior plantings are gone and recent inspection indicates the hardscape of concrete fountains, flowerbeds and tree planters has been removed. The original tree planters were 6-foot-high, marble-tiled boxes arranged in rows.

The water tower near the main entrance is among the most significant character-defining features of the campus due to its size, prominence and sculptural qualities. Saarinen said of its design, "A water tower should not be hidden away; it is a necessary functional thing, but can also be a proud and beautiful vertical accent, like a piece of sculpture."[59] The tower is 127 feet tall from its base to the top of the tank. The tank has a diameter of 72 feet with a convex top of 95-foot radius and

[59] "Bell Labs' Mirrored Superblock," *Architectural Record* (October 1962), p. 152.

a convex bottom of 46-foot radius. Some have suggested that this shape symbolizes a transistor, a significant Bell Labs invention. The tank has three elliptical-plan legs, which are hollow and contain service ladders and pipes. The tank has a circular, domed concrete base that at its center has a 6-foot-tall sculptural concrete pedestal. Floodlights, set on concrete pedestals that ring the base, provided nighttime illumination of the tower but have been removed. The pedestals remain and the developer indicates the lights will be returned.

The campus's main service building, water and sewage treatment and pump plant, maintenance yard, and electrical transmission substation are located to the southwest of the ellipse and screened from view by plantings and grading. In this complex there are also an emergency generator building, ocean simulations facility, bioxide odor control tank, earth station building, roadway sand storage building, outside area test site, and chemical and pesticide storage building. These are utilitarian structures that are not designed to have significant architectural or landscape interest. The same may be said of a small radio range building on the northwest side of the ellipse, which was situated to be next to an open area that could serve as an antenna field for lab communications. There is also a cooling tower/electric room building nestled against a treed hill southwest of the lagoon outside of the ellipse.

In between the inner and outer belt roads to the northeast of the main lab is a modern sculpture honoring Karl Jansky. This monument, dedicated in 1998, marks the site of an antenna in use in 1931 when Jansky discovered cosmic radio waves. The monument is a stylized miniature replica of his radio telescope.

PART III. SOURCE OF INFORMATION

The principal source of primary documentation (drawings, plans, photographs, specifications and correspondence) is the Eero Saarinen Collection at the Sterling Memorial Library, Yale University [ESC]. Nokia Corporation Archives (the former Bell Labs Archives and until very recently Alcatel-Lucent Archives) at Murray Hill, New Jersey, has an extensive collection of aerial views and construction photographs. Contact was also made with the AT&T Corporate Archives. It was determined that most of their materials relating specifically to Holmdel were retained by Alcatel-Lucent as part of the corporate divestiture or were largely redundant of materials on file at Yale or Nokia.

A. Drawings and Plans

Eero Saarinen and Associates. Holmdel Laboratory. Architectural Record Sepias. Sheets 100 to 191. 1959 [ESC, Series IV, Boxes 413, 414 and 416].

Eero Saarinen and Associates. Holmdel Laboratory. Cut and Fill Analysis. Sheets 15 to 24. 1959 [ESC, Series IV, Box 415].

Eero Saarinen and Associates. Holmdel Laboratory. Site Plan Sepias. Sheets 1 to 16. 1959 [ESC, Series IV, Box 419 and Accession 2008-M-065, Box 8].

Kevin Roche John Dinkeloo and Associates. Bell Telephone Laboratories, Holmdel, New Jersey. Addition, Phase III. Sheets A-1 to A-13. 1981[ESC, Series IV, Box 650].

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